



GOING ROGUE: BALANCING HIGH-PERFORMANCE DESIGN WITH PRACTICAL APPLICATIONS

Best Practices to Ensure Successful Implementation of High-Performance Design for our Next Generation of Buildings



YOUR ENERGY GUIDES



Accurate information. Unbiased guidance. Empowered decisions.

Columbus | Dayton | Cleveland

©Go Sustainable Energy, LLC



AGENDA

1

High-Performance Design Focus: Energy

2

Design Versus Reality

3

What Can Go Wrong?

4

Examples from Different Project Phases

5

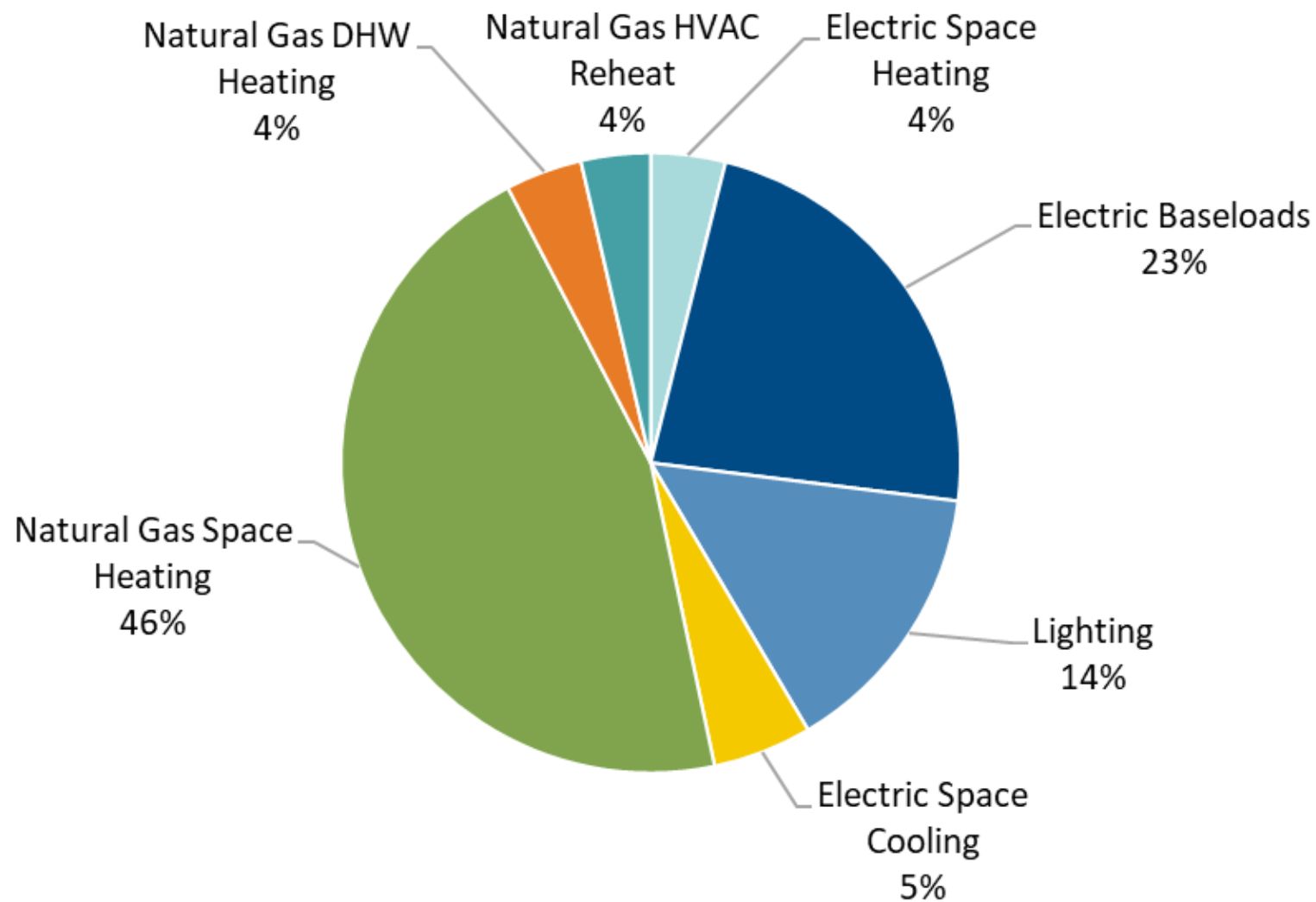
What Can Be Done Instead?

6

Conclusions and Questions!



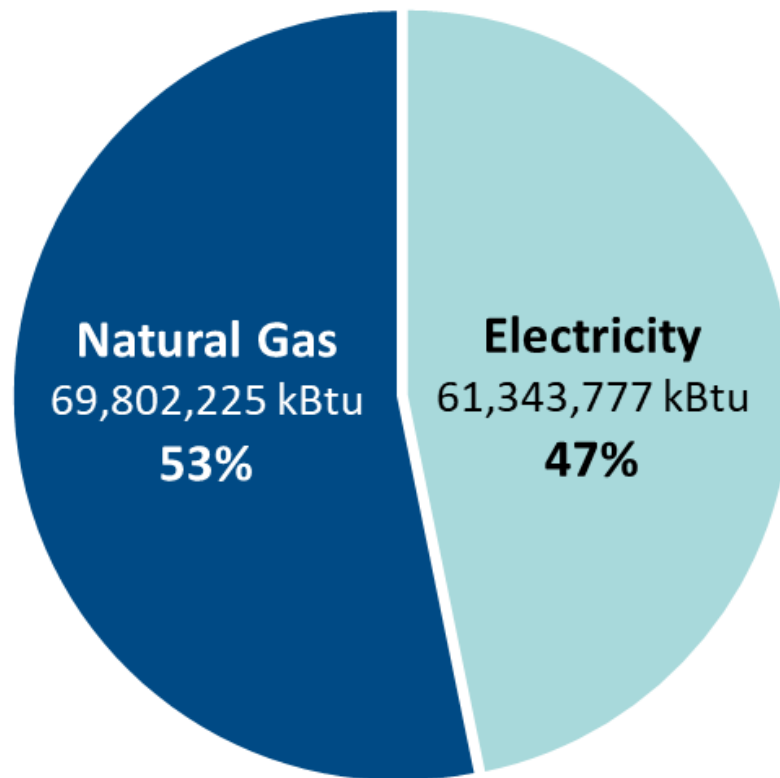
PORTFOLIO ENERGY USE BREAKDOWN



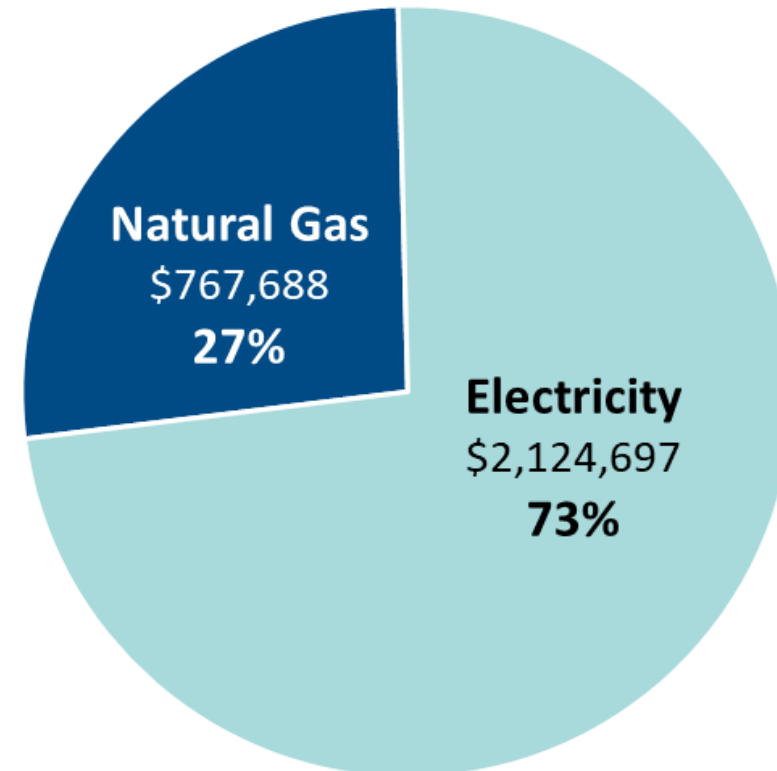


ANNUAL UTILITY USAGE AND COST

Usage



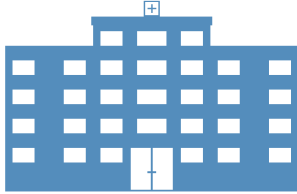
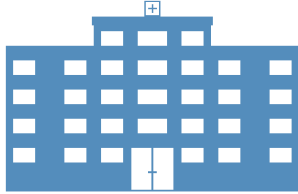
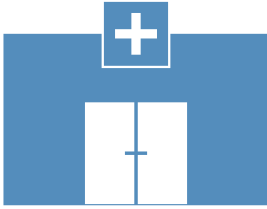
Cost



DESIGN VS REALITY EXAMPLE: VRF SYSTEMS



DESIGN VS REALITY EXAMPLES

				
		Medical Office Building	Medical Office Building	Medical Center
 Design EUI		64	80	56
 Actual EUI after 1 st Year		105	148	94

These are not outliers, these projects represent the norm

WHEN DO THINGS GO WRONG?



Design



Procurement



Construction



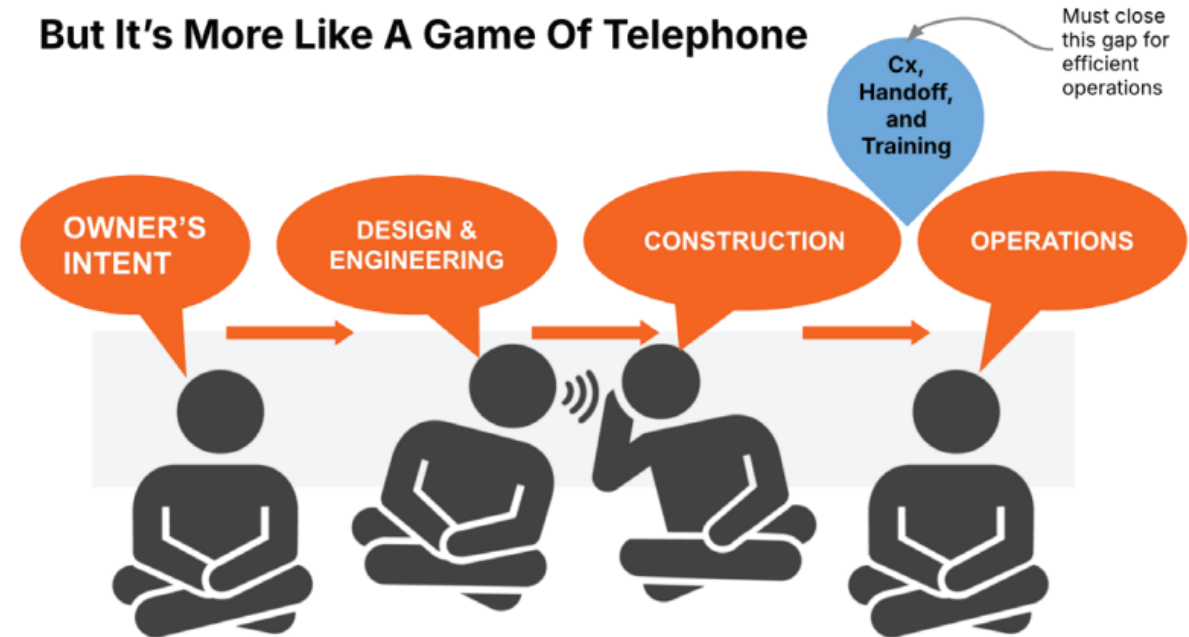
Building Operations

NEW CONSTRUCTION: WHAT CAN GO WRONG?

It's All About Intent



But It's More Like A Game Of Telephone



Source

GPRO Construction Management, Urban Green Council



DESIGN

What Can Go Wrong?

- Drawings and specifications are vague or missing info
- Systems are incorrectly sized
- Workforce shortage for advanced technologies

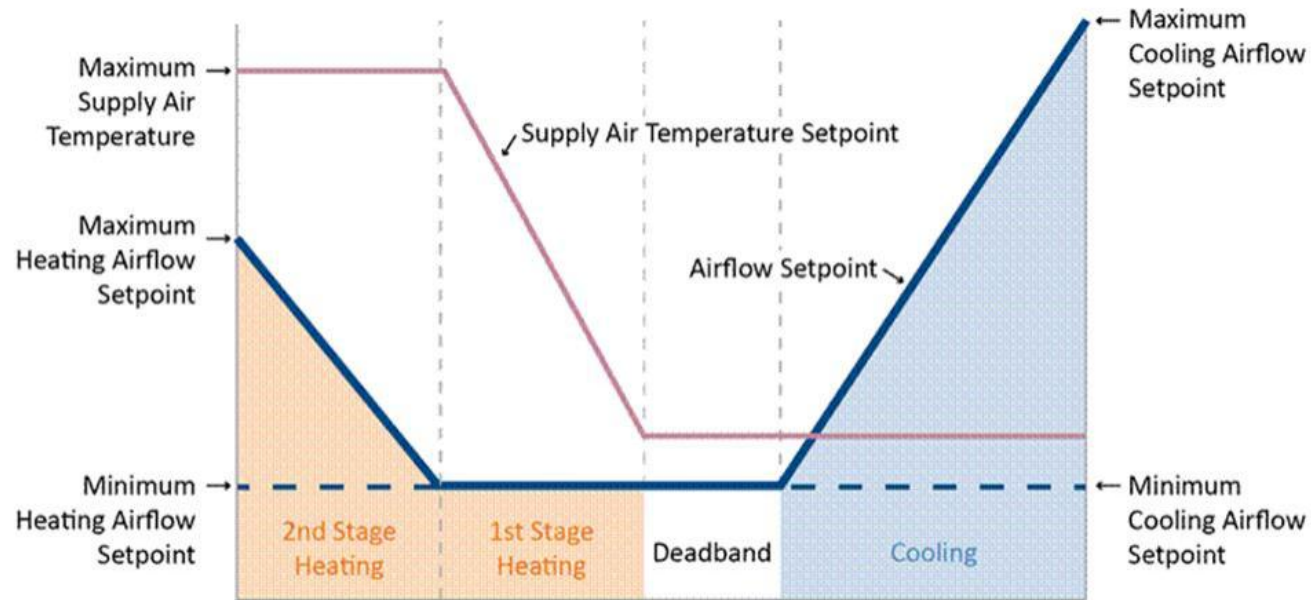
Best Practices to Mitigate:

- Design documents need to be clear, specific, and potentially redundant
- Designers engage stakeholders to ensure advanced technologies are understood and can be maintained
- CxA brought on as early as possible
- Designers share sizing assumptions for review (vent., lighting, load)





DESIGN: VAGUE DOCUMENTS

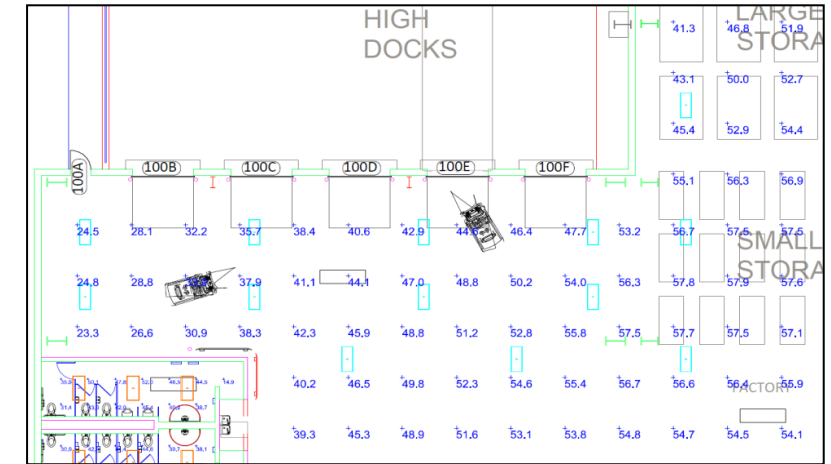
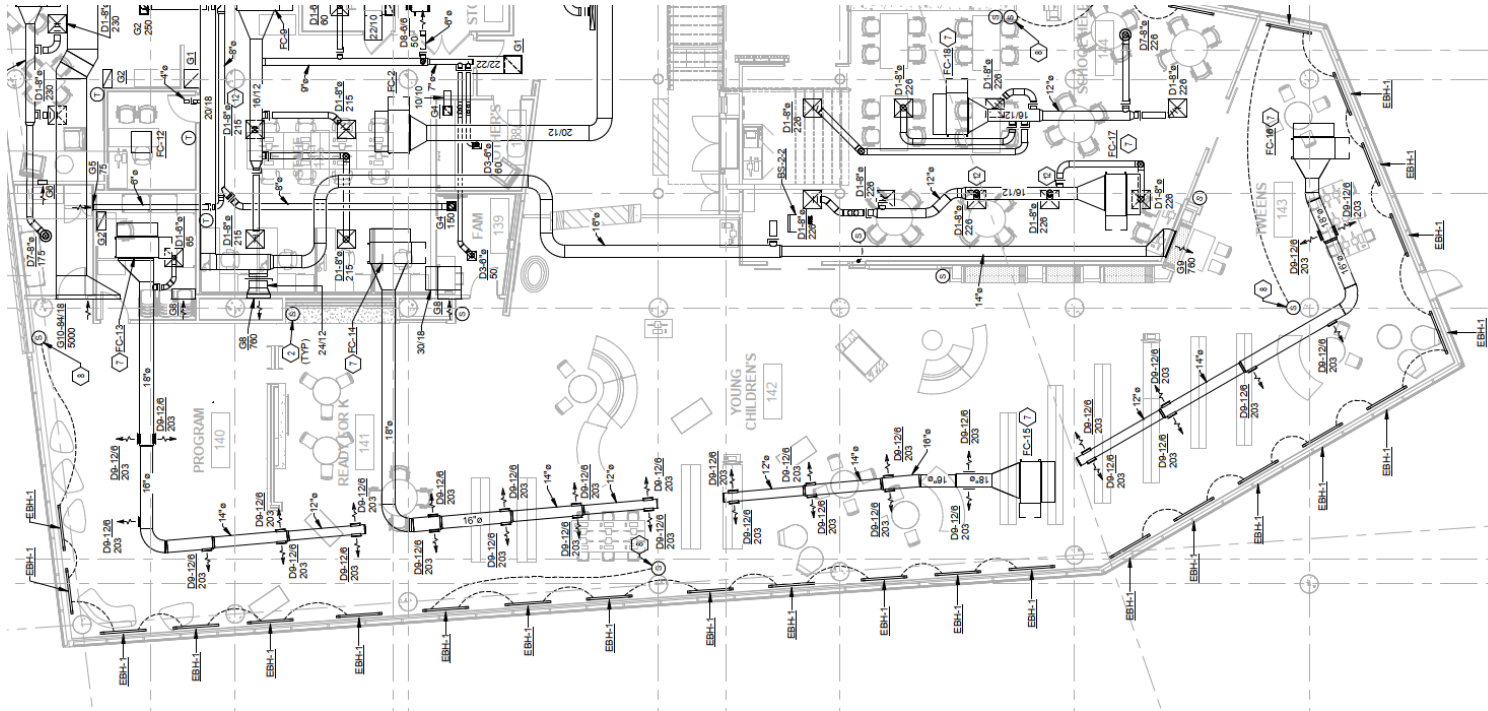


PRIMARY AIRFLOW		HEATING COIL	
MAX	MIN	AIRFLOW MAX	AIRFLOW MIN
685 CFM	140 CFM	275 CFM	140 CFM
400 CFM	80 CFM	160 CFM	80 CFM
725 CFM	145 CFM	290 CFM	145 CFM
375 CFM	75 CFM	150 CFM	75 CFM
600 CFM	120 CFM	240 CFM	120 CFM



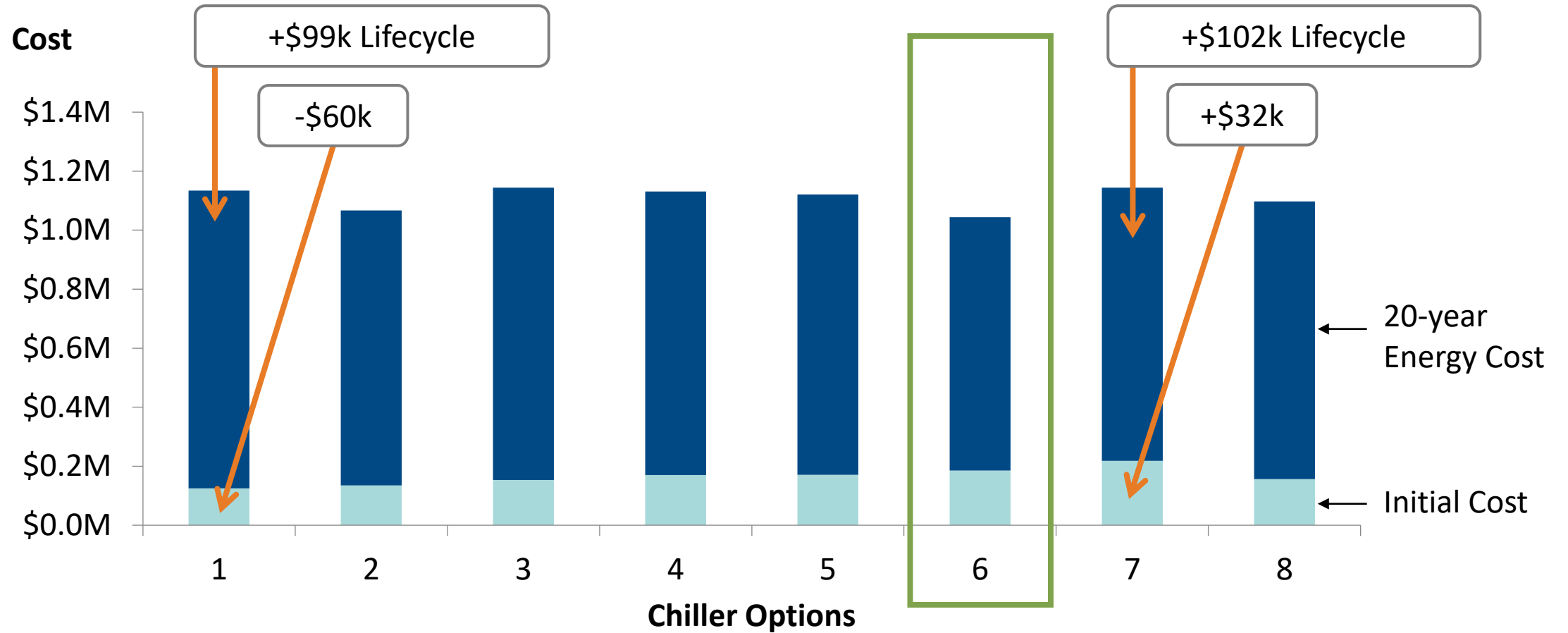


DESIGN: OVERSIZING





DESIGN: EVALUATING LIFECYCLE COSTS





PROCUREMENT

What Can Go Wrong?

- Elements of design rewritten
- Value engineering unforeseen implications
- Wrong equipment purchased

Best Practices to Mitigate:

- Designers, controls vendor, HVAC vendor, and CxA meet immediately to align on sequence of operations
- Designers and CxA carefully review submittals and vet VE item impacts



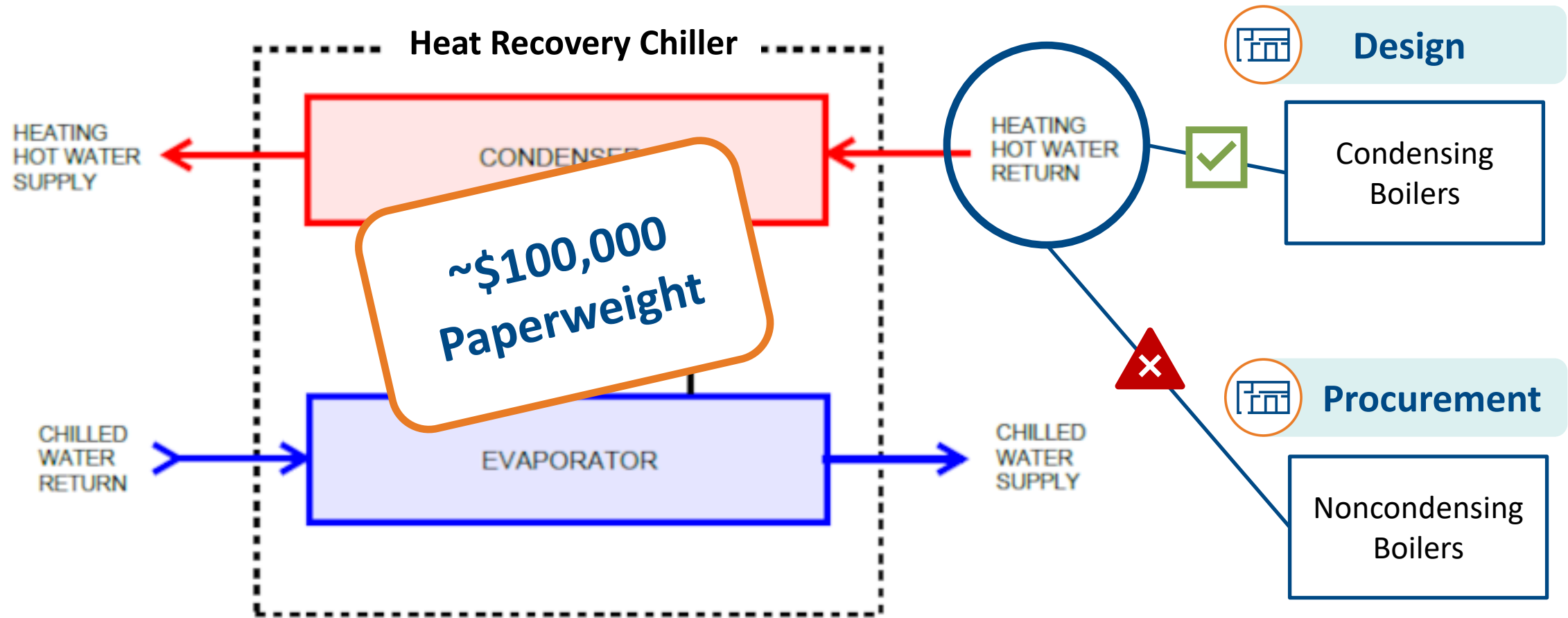


PROCUREMENT: DESIGN REWRITTEN



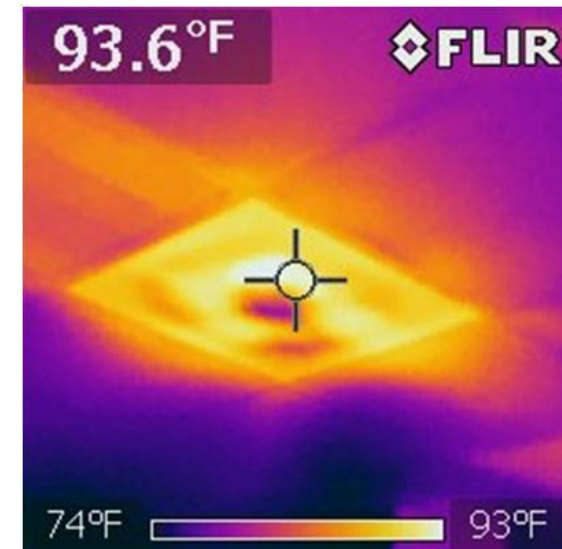
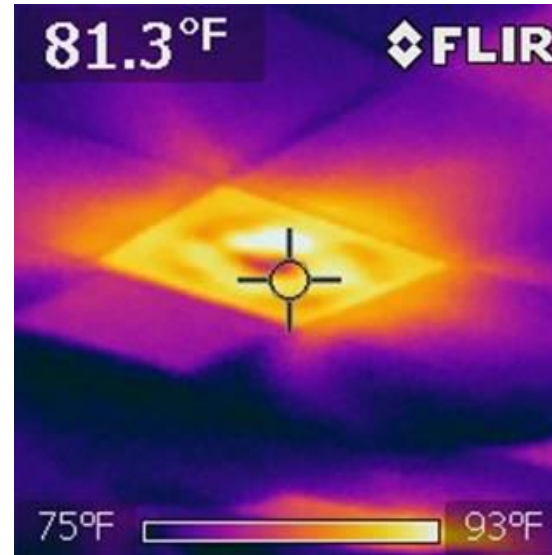
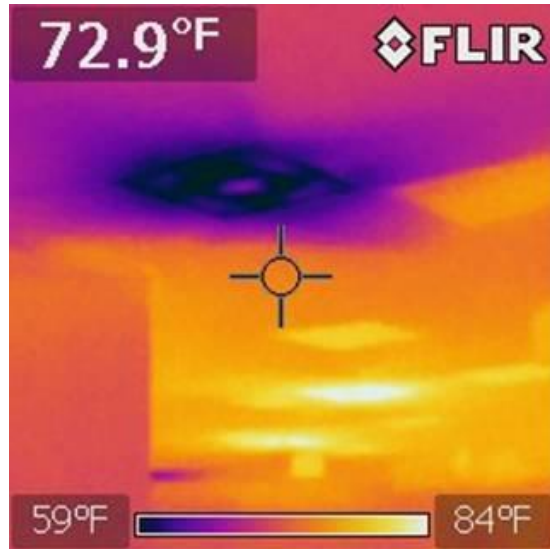


PROCUREMENT: VALUE ENGINEERING





PROCUREMENT: VALUE ENGINEERING





CONSTRUCTION

What Can Go Wrong?

- Improper construction of systems and controls programming
- Nuanced features are never set up
- Workforce shortage for advanced technologies

Best Practices to Mitigate:

- Designers and CxA review and discuss if deviations have unforeseen impacts
- CxA comprehensively test sequences of operation for energy efficiency features





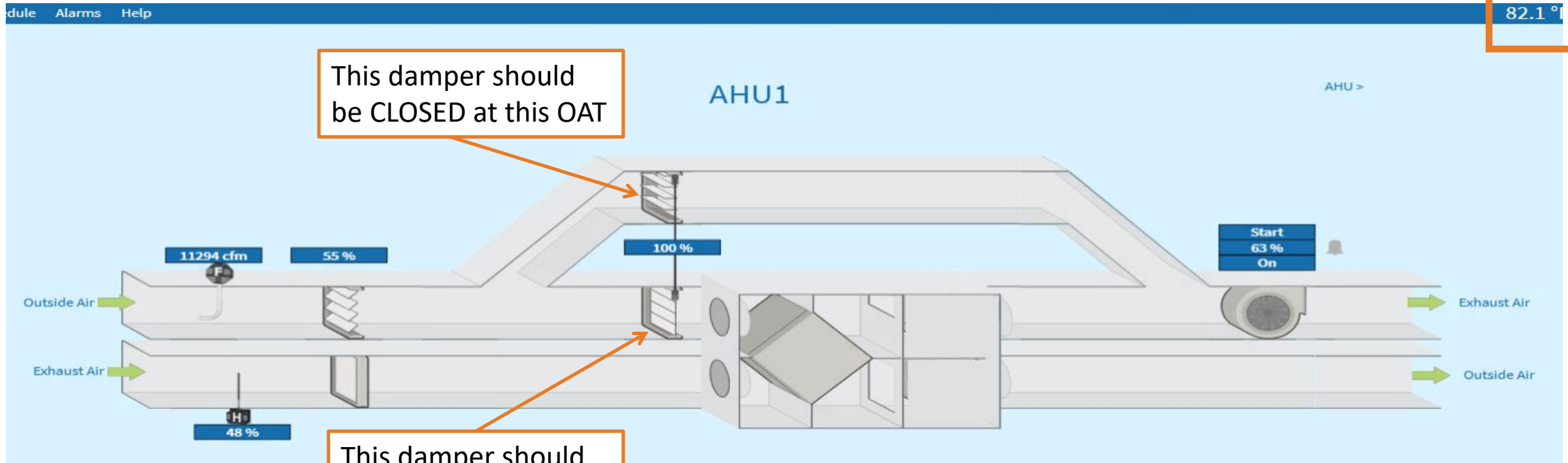
CONSTRUCTION PHASE: INCORRECT PROGRAMMING

Outside Air Temperature (OAT)

82.1 °F

This damper should be CLOSED at this OAT

This damper should be OPEN at this OAT





CONSTRUCTION PHASE: NUANCED DETAILS





BUILDING OPERATIONS

What Can Go Wrong?

- Owner misunderstands nuances of efficiency features:
 - Building automation system overrides
 - Manual systems changes
- Workforce shortage for advanced technologies

Best Practices to Mitigate:

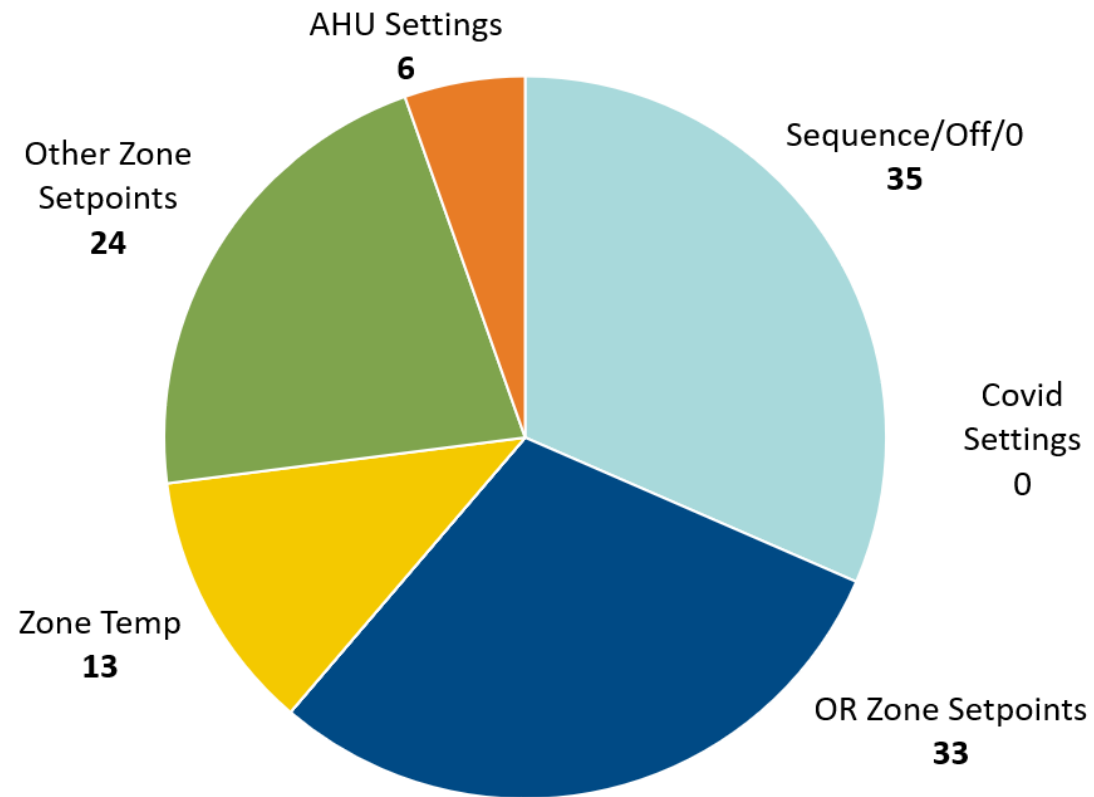
- Designers providing as-built drawings and sequences of operation
- Controls vendors include info on energy efficiency control logic in owner's training
- CxA provides systems manual laying out energy efficiency features in layman's terms





BUILDING OPERATION: OVERRIDES

Active Building Automation System Overrides at a Hospital



Total:
111

SUMMARY OF WHAT GOES WRONG IN EACH PHASE



Design

- Design documents are vague or missing information, leaving room for misinterpretation.
- High-performance control strategy benefit limited by system's design.



Procurement

- Construction team specify wrong equipment.
- Construction vendor has internal directives that are at odds with design.
- Controls team rewrites Designer's sequence of operations.



Construction

- Construction vendor implements systems incorrectly.
- Controls team program sequence of operations differently than Designer intended.



Building Operations

- Building operators override building automation system setpoints.
- Building operators manually adjust systems.





QUESTIONS?

Thank you!

go sustainable
energy 



DESIGN: MISSING KEY ELEMENTS

Supply Air Temperature Set -Point (°F)

